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Implementing Appendix W for Refined Hot-Spot Analysis

FHWA Office of Natural Environment and
FHWA Resource Center, Air Quality Team

December 3, 2019

Outline

- What is Appendix W? What change takes effect January 17, 2020?
- What is AERMOD? How does it work?
- What steps are involved in a refined Particulate Matter (PM) Quantitative Hot-spot Analysis for conformity purposes?
- Summary

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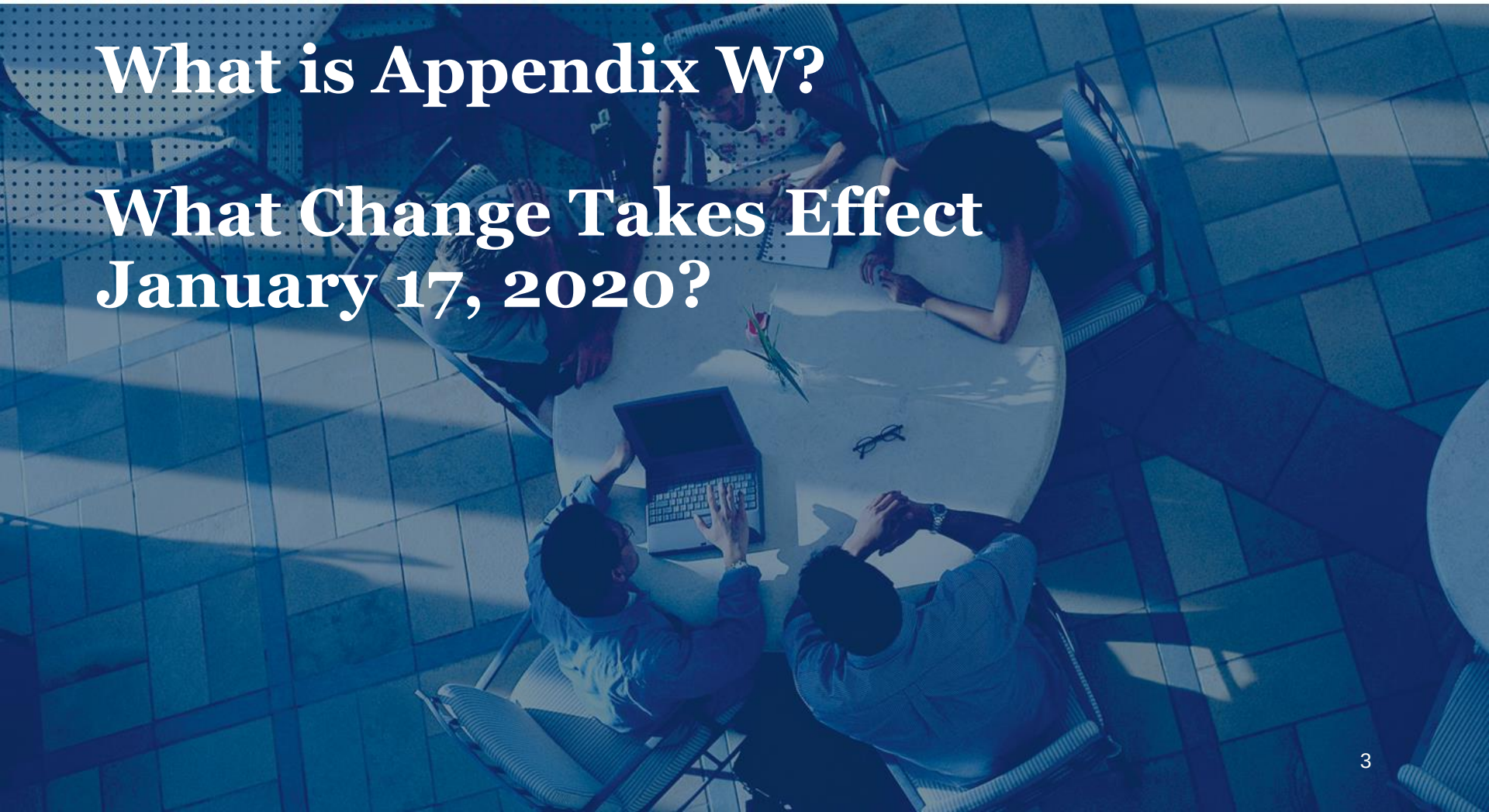
What is Appendix W?

What Change Takes Effect January 17, 2020?



Appendix W

- 40 CFR Part 51 Appendix W, “Guideline on Air Quality Models”
  - https://www3.epa.gov/ttn/scram/guidance/guide/appw_17.pdf
- Provides EPA’s preferred models and other recommended techniques, as well as requirements and guidance for their use in estimating ambient concentrations of air pollutants (dispersion modeling)
- Used for SIP modeling, permitting, conformity and other air quality assessments
- For FHWA, affects CO and PM hot-spot analyses for transportation conformity purposes

2017 Appendix W Final Rule

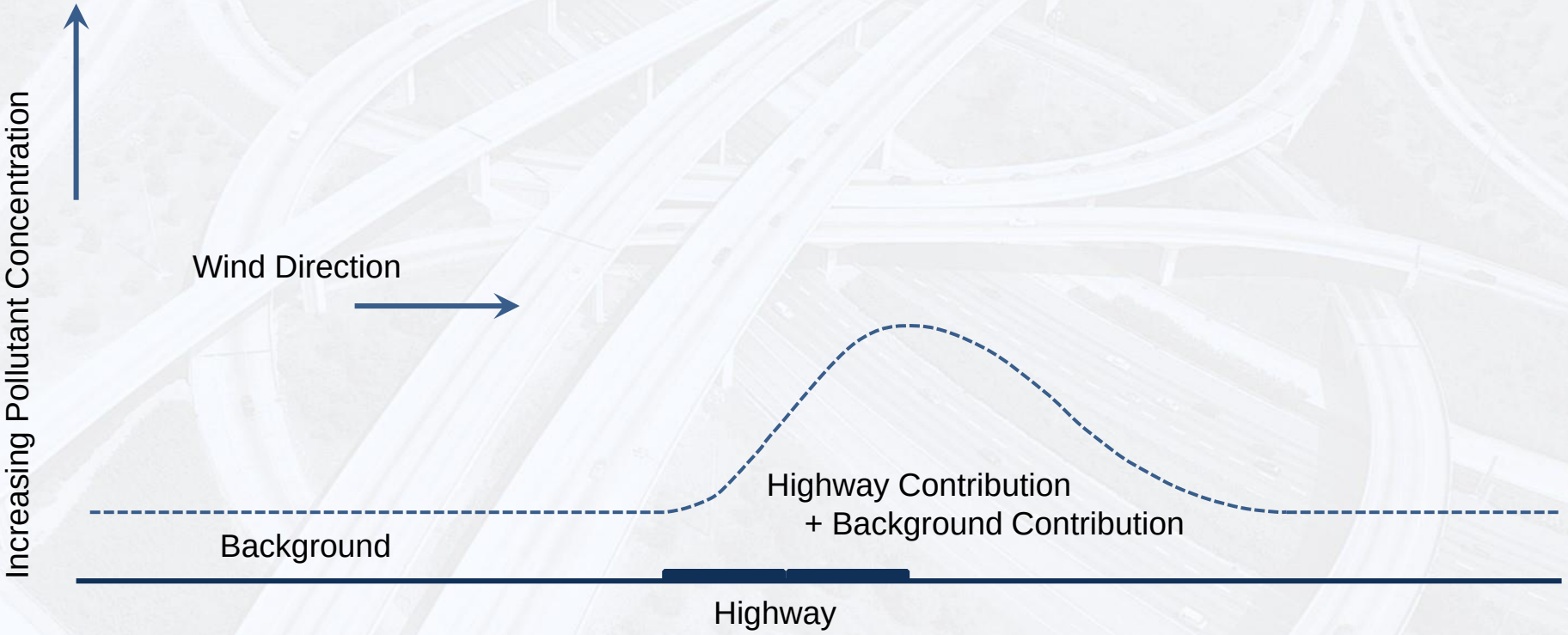
- EPA's January 17, 2017 Final Rule revised Appendix W
  - This presentation focuses on the section of the rule that may impact highway projects
- Refined mobile source applications (PM hot-spot analysis)
  - AERMOD replaces CALINE as preferred model after 3-year transition period, which ends on **January 17, 2020**
  - Continue to choose AERMOD or CALINE3/CAL3QHCR for any refined analysis started before the end of the 3-year transition period
    - Analyses begun with CALINE/CAL3QHCR before January 17, 2020 can be completed after that date
- CO Screening Analysis
  - Continue to rely on 1992 CO guidance that employs CAL3QHC

Defining Analysis Terms

- Hot-Spot Analysis
  - An estimation of likely future localized CO, PM_{10}, and/or $PM_{2.5}$ pollutant concentrations and a comparison of those concentrations to the relevant NAAQS (40 CFR 93.101) for conformity purposes
- Screening model*
  - Simplified assumptions using preset, worst-case meteorology
  - Conservative estimates of air quality impacts
- Refined model*
  - Detailed treatment of physical and chemical atmospheric processes
  - Detailed and precise input data
  - Spatially and temporally resolved concentration estimates

*Paraphrased from Appendix W Section 2.2

Project-Level Hot-Spot Analysis



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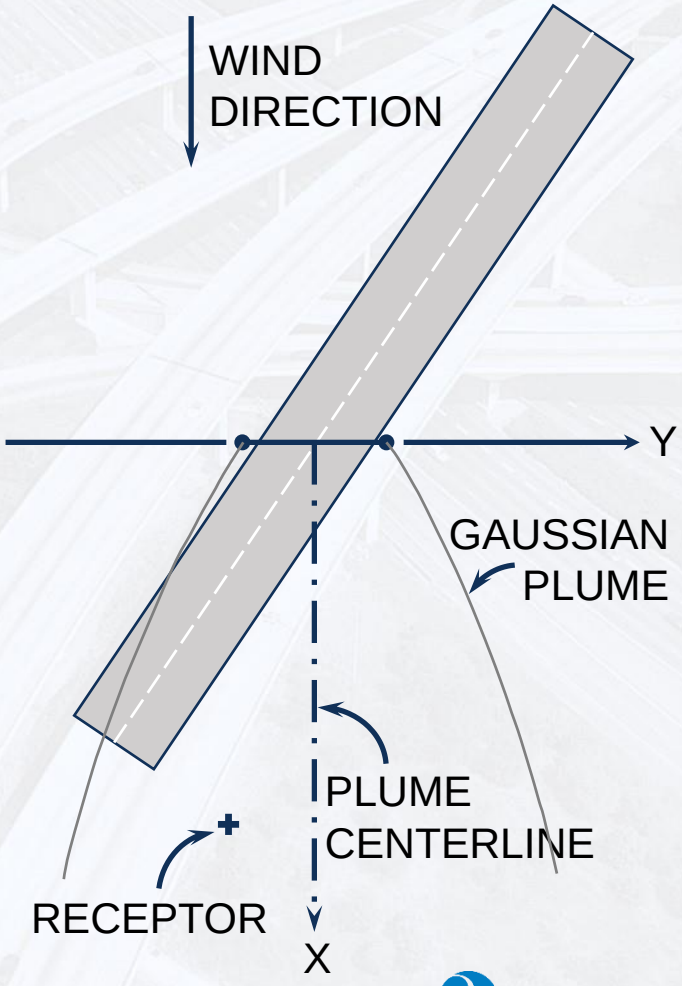
What is AERMOD?

How does it Work?

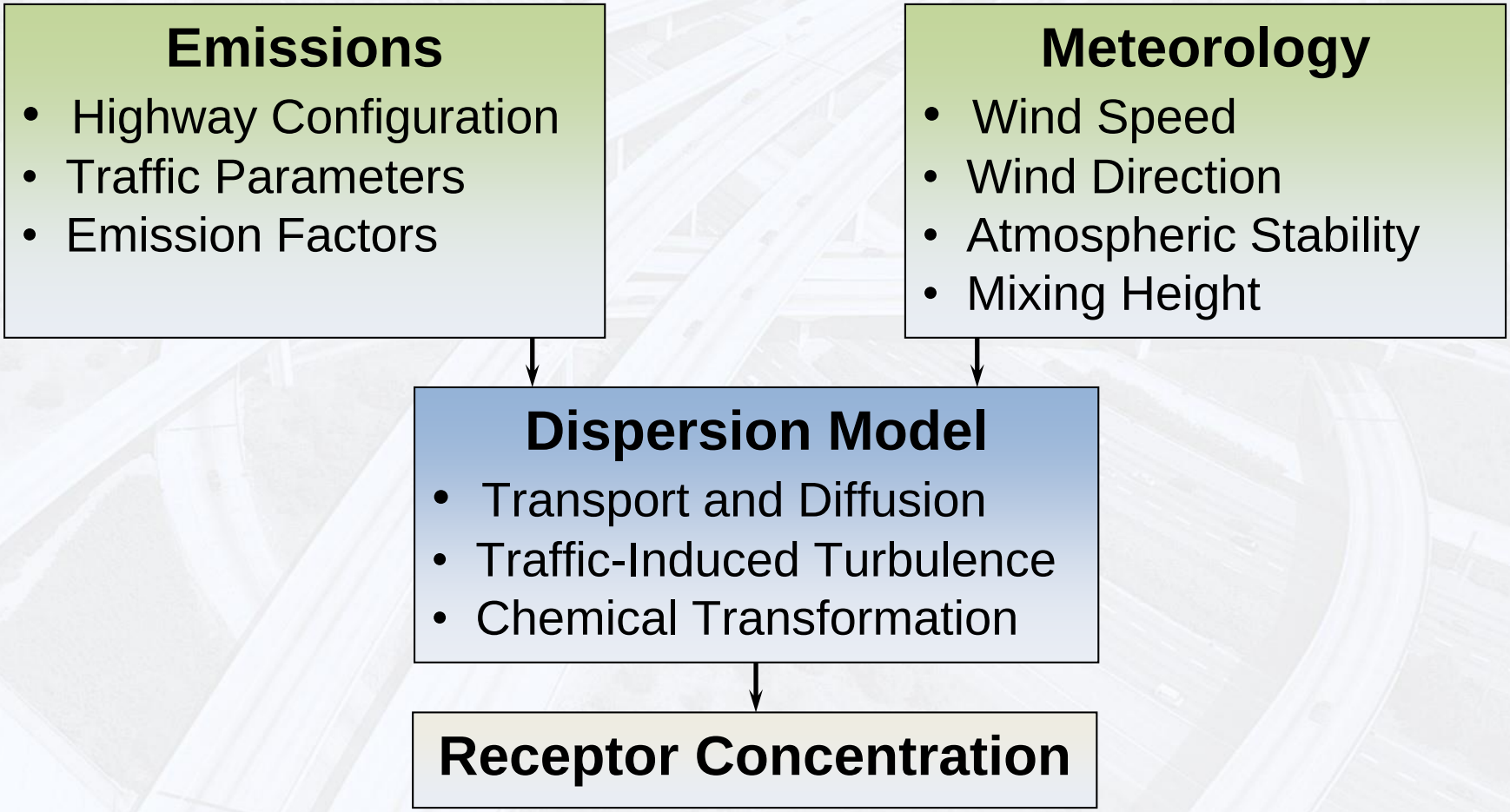
AERMOD

- American Meteorological Society/EPA Regulatory Model (AERMOD)
  - Steady-state plume model
  - Air dispersion based on planetary boundary layer turbulence structure and scaling concepts

Plume Dispersion from Highways

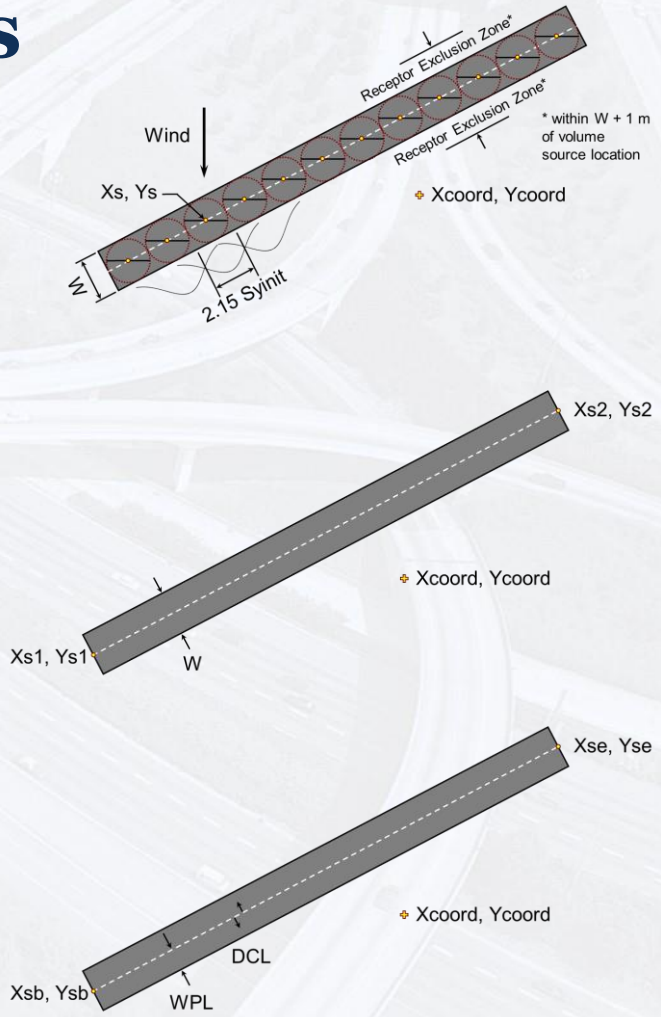


Highway Air Dispersion Modeling



AERMOD Source Type Options for Modeling Highway Projects

- VOLUME
  - Xs, Ys = Volume source center
  - W = Link width (source spacing = W)
  - Syinit = Initial lateral dimension of volume source (W / 2.15)
- LINE
  - Xs1, Ys1 = Link midpoint start
  - Xs2, Ys2 = Link midpoint end
  - Xcoord, Ycoord = Discrete receptor
  - W = Link width
- RLINE* - same setup as LINE
- RLINEXT**
  - Xsb, Ysb = Link midpoint start
  - Xse, Yse = Link midpoint end
  - Number of lanes in link
  - WPL = Width of each lane
  - DCL = Distance from link centerline



*Beta option, see next slide for implications.
**Alpha option, see next slide for implications.

AERMOD 19191 Beta and Alpha Options Released August 21, 2019

- RLINE source type was added as **beta option** to AERMOD 19191 release.
  - Use for regulatory applications **must be approved by EPA** through their alternative model approval process (see 40 CFR Part 51 Appendix W, Section 3.2)
  - For more information see Section 2 of EPA's "Guidance on New R-LINE Additions to AERMOD 19191 for Refined Transportation Project Analyses"
- RLINEXT source type was added as **alpha option** to AERMOD 19191 release.
  - **Regulatory use not permitted**. Alpha options are for user evaluation and feedback of new features, such as:
    - Roads with a solid barrier and depressed roadways (RLINEXT only)
    - Urban dispersion option (RLINEXT or RLINE)
  - For more information see Section 3 of EPA's "Guidance on New R-LINE Additions to AERMOD 19191 for Refined Transportation Project Analyses"

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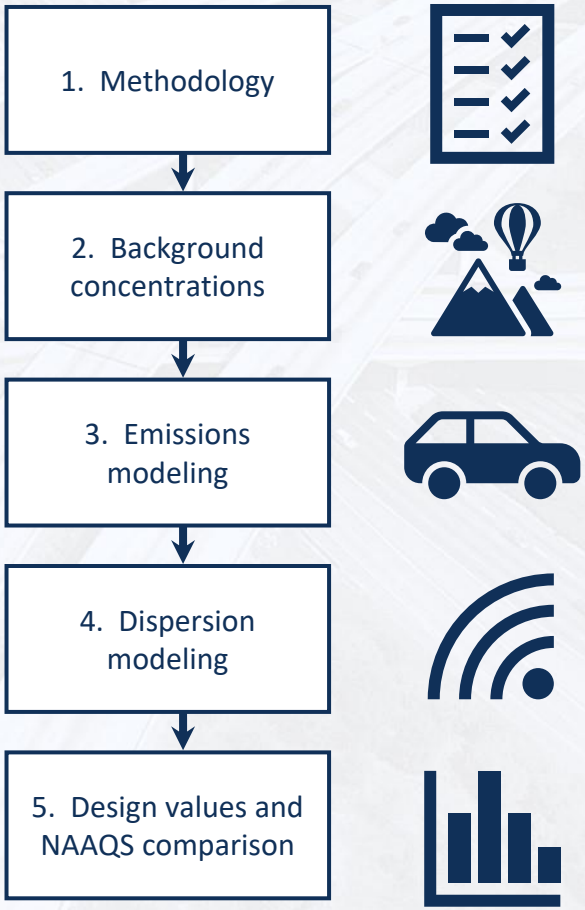
What Steps are involved in a refined PM Quantitative Hot-spot Analysis for Conformity Purposes?

PM Hot-Spot Analysis Overview



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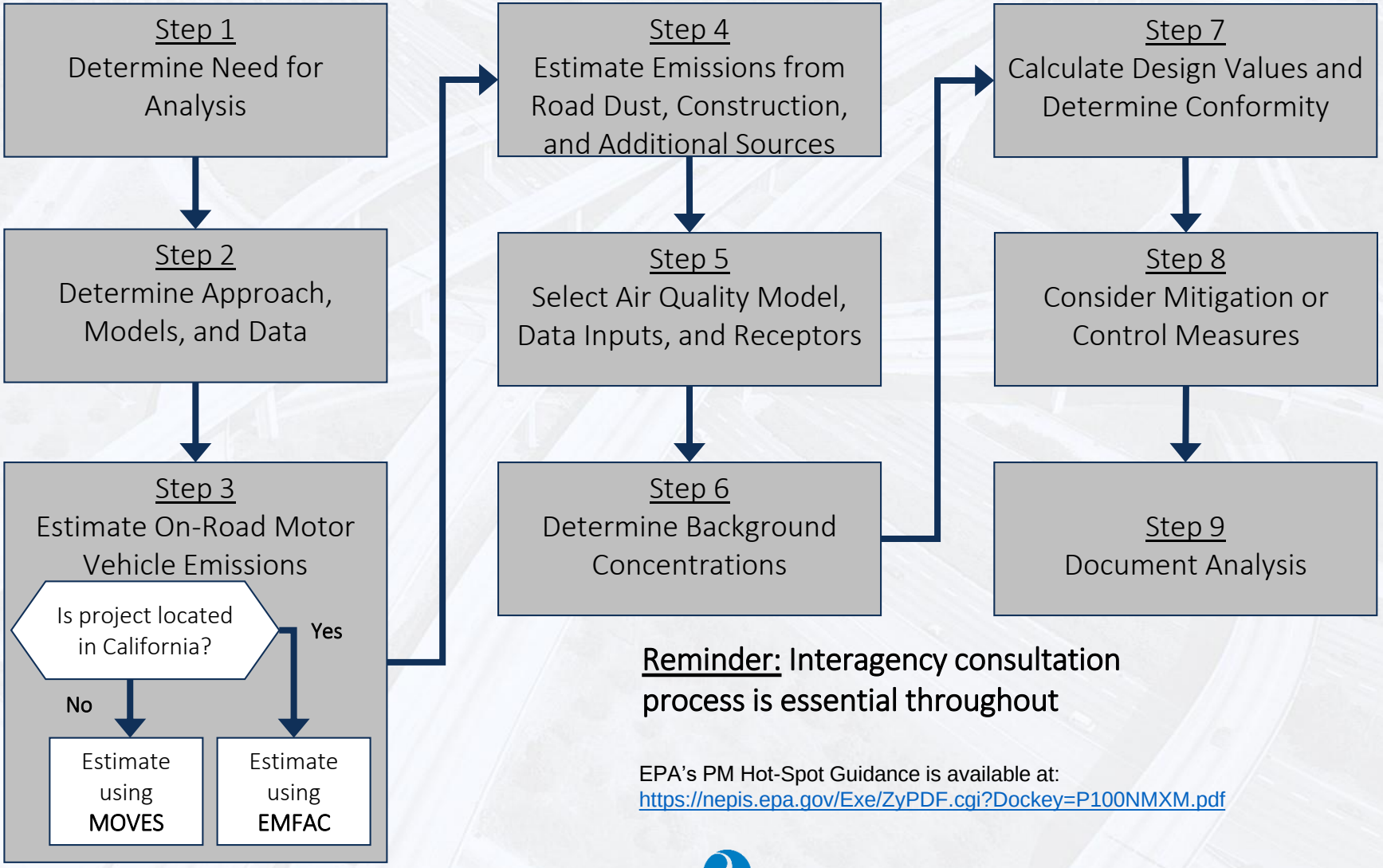
PM Hot-spot Guidance Analysis Steps



Reminder: Interagency consultation process is essential throughout

EPA's PM Hot-Spot Guidance is available at:
https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100NMXM.pdf

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Summary

Summary of Important Points

- Three-year transition period to replace CALINE with AERMOD for refined hot-spot analysis ends on **January 17, 2020**
- Three options for modeling highway projects in AERMOD
- PM hot-spot analyses require a considerable amount of time and effort, but are not needed for all projects

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Questions?

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